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ABSTRACT

The Minnesota Computer Aided Library System (MCALS) provides a basis of unification for library service program development in Minnesota for eventual linkage to the national information network. A prototype plan for communications functions is illustrated. A cost/benefits analysis was made to show the cost/effectiveness potential for MCALS. System costs, system benefits, perscnnel allocation, building space requirements, and transfers of library materials, were analyzed. Nine additional benefits of autcmation are given, and a cost to benefits comparison are given. Ccmparison tables for the factors involved are included, with illustrative footnotes explaining the rationale for the comparisons. (Further information of the system may be found in LI 002 214.) (AB)

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MINNESOTA COMPUTER AIDED LIBRARY SYSTEM (MCALS) UNIVERSITY OF MINNESOTA SUBSYSTEM COST/ BENEFITS ANALYSIS

Systems Division
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1. GENERAL SYSTEM DESCRIPTION

The Minnesota Computer Aided Library System (MCALS) will provide a basis of unification for library service program development in the state of Minnesota, eventually linking Minnesota to the emerging national information network. The objectives of the system are:

1. Improve access to all collections throughout the state for users and libraries.
2. Improve service by reducing the time it takes to order, catalog, process, and locate library materials throughout the state.
3. Increase the ability of libraries to cope with the growth of collections and the increased demands for new and better services.
4. Better use of professional librarian's time in providing direct services to users in each library.
5. Enable Minnesota libraries to make full use of the national library networks which are now taking form.

Figure 1. illustrates the prototype plan for communications functions for MCALS. There are presently in existence within the state entities which are fulfilling certain nodes in this prototype relationship. For example both the Non-Academic and Academic interlending of materials are now being accomplished via service nodes on the left and right center of the diagram. Sub-nodes exist in the public library system with the existence of systems or agencies capable of being a prime node. Therefore much already exists to permit such a plan to function for expedited user services.

MCALS as now envisioned would be developed at the University of Minnesota Libraries in cooperation with various library agencies throughout the state. Funding is proposed through the Minnesota Higher Education Coordinating Commission which has approved the program and established an Advisory Board. The Commission will submit a budget request to the 1971 Minnesota State Legislature. In addition, the MCALS program has been included as a specialized function within the state's plan for computing in higher education.[1]

In order to show the cost/effectiveness potential for the MCALS program, a cost/benefits analysis was done using the University of Minnesota estimated budget figures. The time frame for the analysis was very short which made it impossible to consider any but the cost/benefits to the University of Minnesota Library. We weighed this outcome against the total estimated budget for an eight year development period, 50% of which involves development of direct state-wide service programs.

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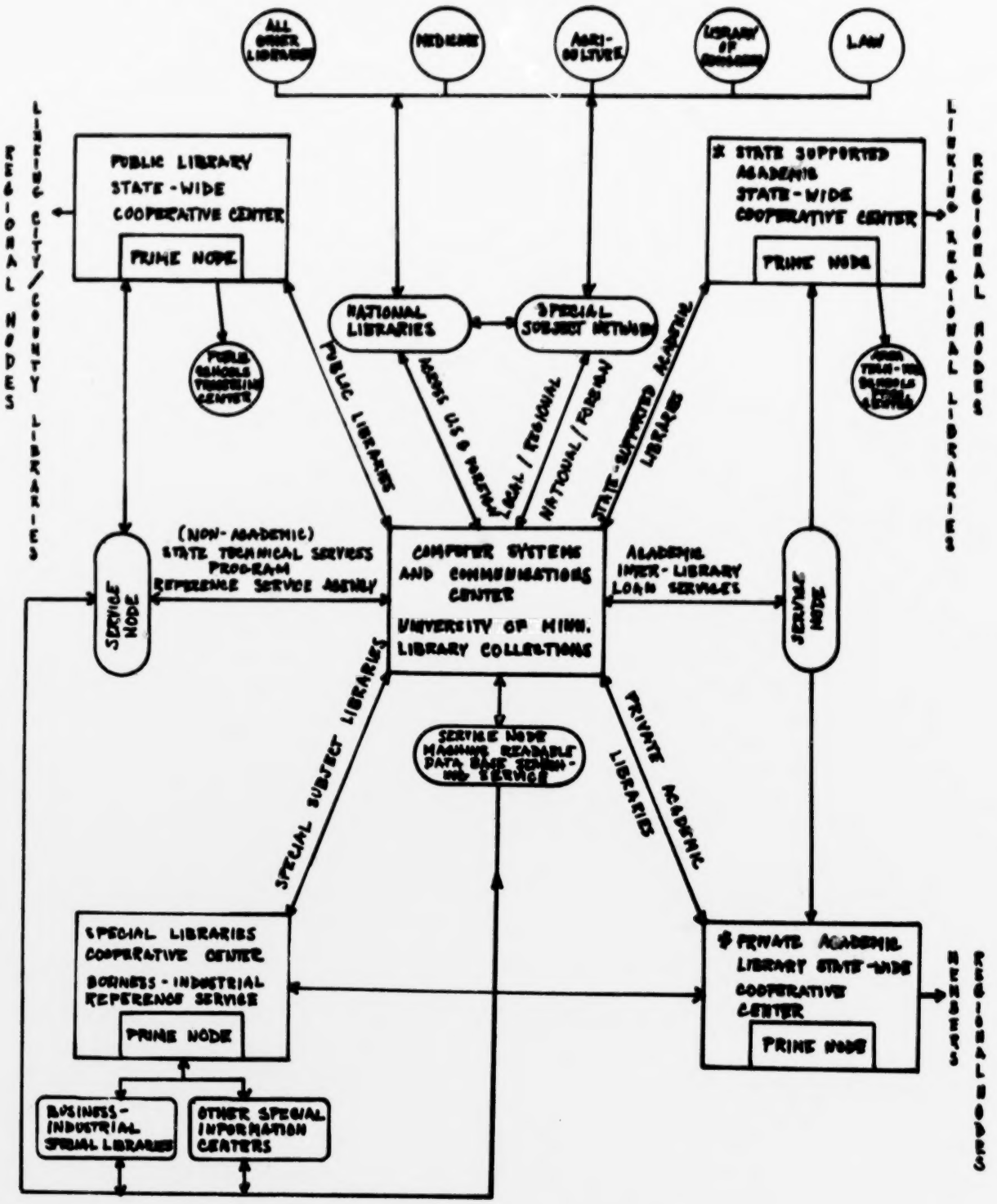
[1]Analysts International Corp. Information Systems in the State of Minnesota. Part IV. Computers and Information Systems in Higher Education. Minneapolis, Minnesota, MHECC, 1970.

FIGURE 1 PROTOTYPE PLAN FOR COMMUNICATIONS FUNCTIONS IN THE MINNESOTA COMPUTER AIDED LIBRARY SYSTEM (MCALS)



LEGEND

⟷ - COMMUNICATION / INFORMATION FLOW

PRIME NODE - Major message switching point

REGIONAL NODE - To be determined through subsequent study by library user population, geographic factors, planning regions, etc. A regional node may service all types of libraries in its region.

* One prime node may serve both types of academic library if so designed.

Figures 2. and 3. illustrate the MCALS implementation schedule. Figure 2. covers those areas basic to the program modules described in Figure 3. and also of initial direct benefit to the University Libraries and their user population.

The basic assumption of this study was to show whether or not the MCALS program was cost/effective for the University. If the program were cost effective for the University we must conclude that it would be so for every library system in the state as a partner in services.

2. COSTS/BENEFITS ANALYSIS OF MCALS - PHILOSOPHY.

A costs/benefits analysis usually consists of a detailed accounting of all positive (benefits) and negative (costs) effects of a proposed system, with dollar values attached to all effects. This proposal is characterized more by a new manner of performing the same activities than by the introduction of new activities. One way to approach a costs/benefits analysis of such a change would be to treat each system (existing and modified) separately to see which resulted in the greatest net benefits. We chose instead to assign a value directly to the changes imposed by automation on the existing system, thus approaching the comparison between the existing and the modified system immediately in our analysis. One reason for this choice was the lesser investment of time required by this method of analysis. A more important reason was the better responses from the professionals in the system who contributed to this analysis when projections were based on changes to the known rather than entirely on the unknown.

We departed from the typical approach in several other important respects also, but without compromising the favorable results attained. First, we did not attempt to assign dollar values to costs or benefits which are not usually thought of in those terms. These include such costs as the turmoil associated with a major system change, the necessary retraining of users and staff in the new methods, incompatability of methods and procedures with other libraries from the users perspective (temporary cost we hope, since automation will eventually affect all but the smallest libraries), and the impersonal interfaces with electronic devices or computer produced materials replacing some personal interchanges which can be more rewarding. Benefits which we did not assign dollar values to include the entire range of patron service improvements resulting from immediate access to complete bibliographic, status, and location information at every system entry point, and the additional patron services which can be provided by the staff who are freed from technical processing activities. Our justification for not treating these factors in detail is our conviction that benefits will greatly outweigh costs with respect to these intangibles. Since the proposal can be justified without consideration of these intangibles, it would serve no useful purpose to assign dollar values to them and to treat them in great detail in this analysis.

FIGURE 2

BASIC SYSTEMS DEVELOPMENT IMPLEMENTATION SCHEDULE
MINNESOTA COMPUTER AIDED LIBRARY SYSTEM (MCALS)

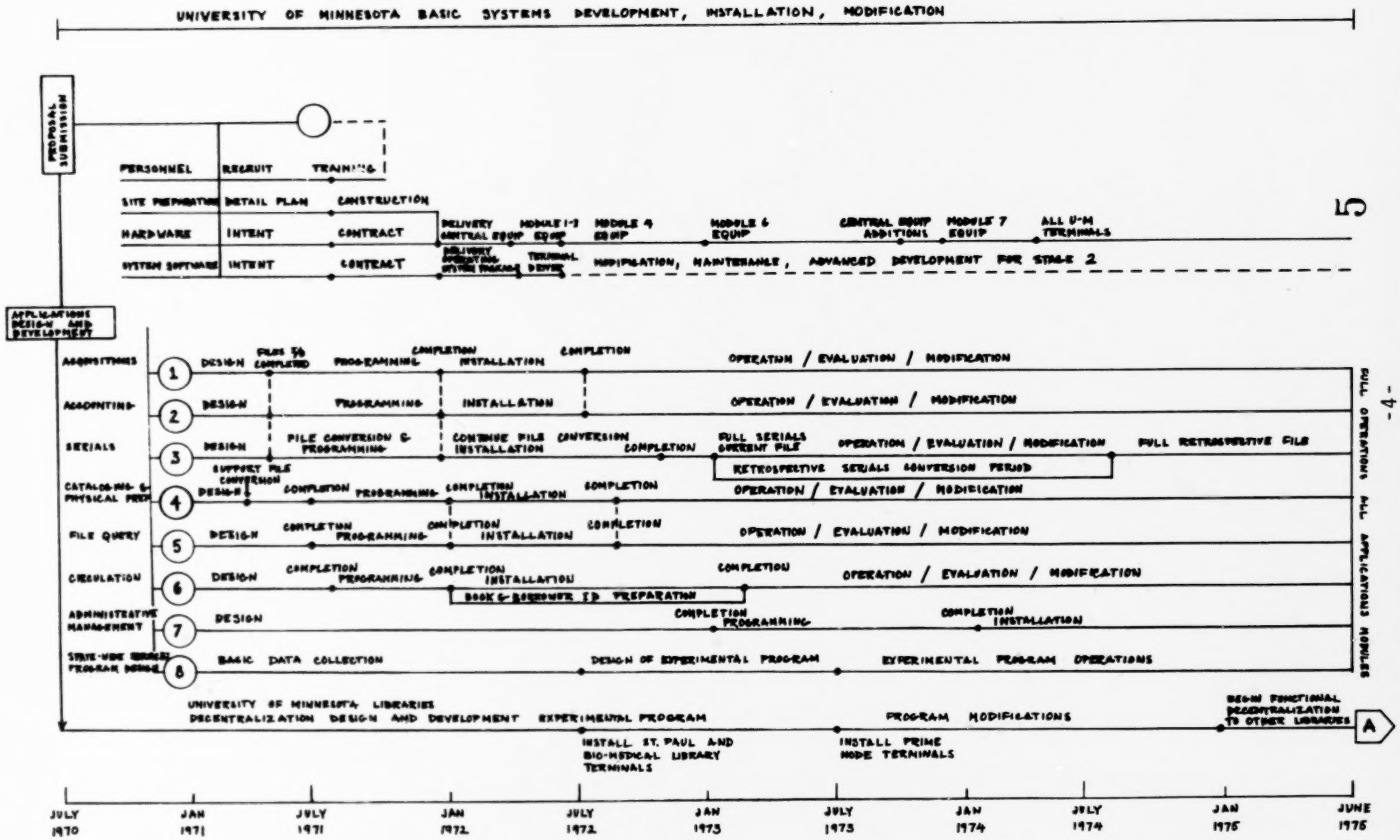
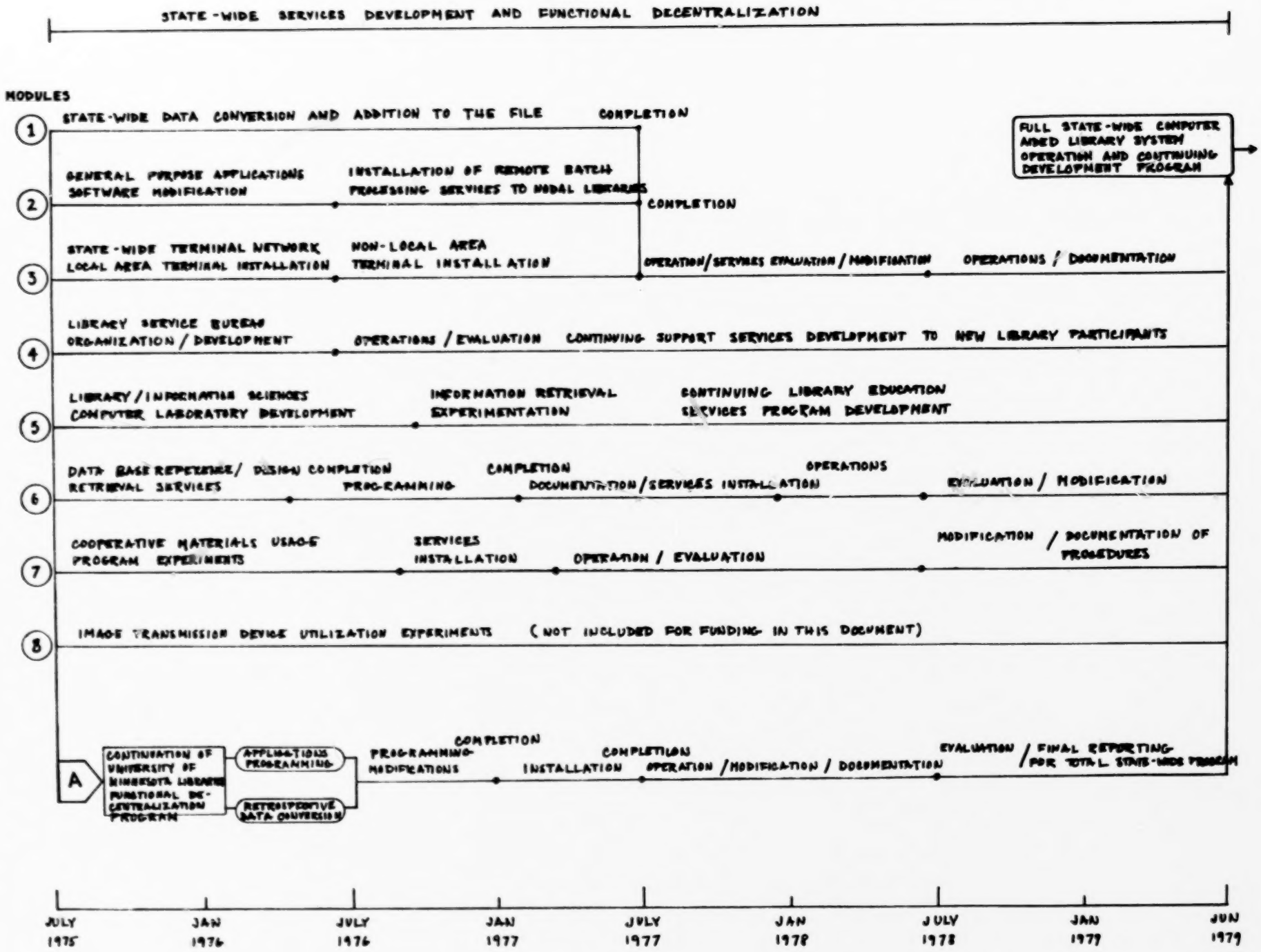


FIGURE 3

STATEWIDE SERVICES PROGRAM DEVELOPMENT IMPLEMENTATION SCHEDULE
MINNESOTA COMPUTER AIDED LIBRARY SYSTEM (MCALS)



Second, we limited consideration of even tangible benefits to only the most conspicuous. We treated only personnel costs and building space in detail with only a brief mention of other tangible benefits which would result from automation. At the same time, we were as complete as possible in detailing tangible system costs. It was necessary to be complete with cost figures, since the funds for the system must come from a special appropriation for that purpose. But, it was impractical to treat benefits as thoroughly since the magnitude of the effort necessary to develop these figures was unjustifiable in view of the value of the proposal demonstrated by using only the partial figures readily available for benefits.

Finally, we used professional opinions of the staff involved in particular activities to estimate the present distribution of time for various tasks and to estimate the changes which would result from automation. Direct system observations (e.g. time and motion studies) are very time consumming in all cases and are particularly so in libraries since the volumes and nature of many tasks vary greatly by the hour of the day, the day of the week, the week of the school term, and the month of the fiscal year. For that reason, we chose to use the professional judgements of the staff as the basis for our analysis. We believe that enough professionals were queried in this investigation to minimize the risk of distortion due to misconceptions about what was expected, what was wanted, potential threats of automation, and potential benefits of automation. The averages used for the costs to benefits comparison in sub-section 5 should not be greatly affected by any of these possible biases.

While we have taken many short cuts in the preparation of this costs/benefits analysis, the net effect of each was to understate either tangible or intangible net benefits. We were very deliberate in our effort to weight the entire analysis toward an understatement of benefits when estimating and projecting figures, rather than toward an exaggeration of benefits, which would have lead to a situation of expectations inflated beyond the proposed systems capability to fulfill them. Similarly, we were careful to weight the analysis toward an overstatement of system costs (e.g. 57% overhead, benefits, supplies figure for costs compared to 30% for benefits and one and one half million dollars for retrospective conversion) rather than an understatement which would have lead to funding shortages causing compromises in the development effort. The results of this analysis present a conservative minimum estimate of the potential benefits of the system we propose.

3. SYSTEM COSTS

The costs of the proposed system have been divided into those which are one-time costs and those which are continuing costs. Factors treated as initial one-time only costs in this analysis should not be considered permanent and final once implemented. In a continually changing system such as this, there will be occasional needs for modifications of facilities. It is only for the system proposed here that these costs are one-time only.

Annual continuing expenses represent those costs which will be necessary to develop, install and operate the proposed system. Of these, only the costs of system operation are actually relatively constant over time (assuming only minor changes in the proposed system). In fact, except for the computer operators and the clerical support personnel, the operating costs of the system proposed here are almost independent of the volume of activity in the system.

Development expenditures will be lower in the first year due to the delays involved in staffing up for an effort such as this and the time schedule of the effort which does not call for programming staff until a considerable portion of the system design has been completed. Similarly the time schedule does not provide for completion of all Phase I activities on the last day of the fourth year of development. For many of the development staff, much of the fourth year of the program will be devoted to the initial stages of the second phase of the proposed development schedule. Thus, though in linear time the development of Phase I will require 4 years, in terms of the annual cost of the development budget as described in Table 2, Phase I will require only slightly more than 3 years (we estimate 3.25). Similarly, Phase II will require 2.25 years of the annual development budget.

Installation costs refer to the on-going conversion efforts to bring retrospective information into the automated system. Where possible these efforts will be made to coincide with other special projects to minimize the costs of both efforts. For example, much of the work involved in transferring volumes is a result of errors, discrepancies, changes in procedures, and other factors which affect the present status of bibliographic materials. Since much of the work in conversion of files to machine readable form will be generated by these same conditions, every effort will be made to perform these two projects on a collection simultaneously. In view of these potential cost savings and the fact that the personnel involved in the conversion are professional librarians and support personnel who can perform other library functions equally as well, the allocation of personnel to the conversion effort must be governed by consideration of the total library operation. Thus the figures shown as annual conversion costs are average annual central processing efforts on the conversion problems (the figure does not represent the efforts of departmental librarians and others from libraries linked at the later date to the automated system.)

Table 1 shows the estimates of the expenses involved in site preparation and initial conversion of library files. Table 2 depicts the annual expenses of the program proposed. Table 3 represents the annual cost of operating the computer facility itself. Table 4 outlines the projected cost of the proposed system by year.

In summary, these figures show that the total cost of the proposed system is $8,275,723 over the eight years of the project. Annual expenses for the project are relatively constant at approximately one million dollars per year (the range is $896,138 for the first year to $1,157,203 for the third and fourth year.) Of the total project cost, 45% is for operation of the system, 33% for system development, 18% for conversion of retrospective materials, and 4% for initial one-time only expenses.

Table 1

Initial One-Time Only Expenses

site preparation		
computer site	$ 62,080	
terminal sites[1]	12,000	
staff site	10,480	
transmission line preparation[2]	42,000	$ 126,560
facilities acquisition		
office equipment	$ 15,000	
off-line storage[3]	10,000	
off-line storage library equipment	3,000	$ 28,000
initial file conversions		
accounts file	$ 500	
vendor file	5,000	
authorized borrower file[4,5]	62,500	
continuations file	75,000	
depository file[4]	2,500	
subject authority file[4]	1,000	
catalog file[6]	0	$ 146,500
Total initial costs		$ 301,060

1. 60 sites at $200 each.

2. 30 sites at $150 each, 30 sites with an average of 1000 feet of cable at $1.25 per foot.

3. tapes, disk packs, etc.

4. already in machine readable form, requires only file format conversions.

5. includes cost of preparing machine readable cards for borrowers.

6. Due to the size of this file retrospective conversion would not be done initially. We assume the proposed system would begin with current materials as of a certain date.

Table 2

Annual Project Expenses

conversion of retrospective material			
personnel			
4 catalogers @$11,000	$44,000		
5 clerical positions @ $5,000	25,000		
miscellaneous help - 5000 hrs. @ $2.00	10,000		
fringe benefits - 11% of full time staff cost	7,590		
supplies 6% of direct labor	4,740		
overhead 40% of direct labor	31,600	$122,930	
equipment			
10% of site operation (Table 3)	65,884		
special purpose leased equipment optical scanners, etc.	1,200	67,084	$190,014
operating expenses			
site expenses (70% of total - see Table 3)	$461,181		
lease of transmission lines	10,000		$471,181
development expenses			
personnel			
director ½ time	$ 9,000		
program manager	15,000		
systems manager	15,000		
5 programmer/analysts	55,000		
5 systems analysts	70,000		
secretary ½ Time	3,500		
clerical support, 2 positions	10,000		
systems engineer ¼ time	3,500		
2 system software specialists at 12K & 15K	27,000		
system librarians, 2 positions	24,000	$232,000	
fringe benefits 11% of direct labor	25,520		
supplies 6% of direct labor	13,920		
overhead 40% of direct labor	92,800	132,240	
equipment 20% of site operation (Table 3)		131,768	$496,008
Total Annual Expenses			$1,157,203

1. Rather than compute a detailed budget for each year of the project independently, we developed what would be a full complement of staff for the operation and a full equipment configuration, and used this to estimate annual costs by year assuming gradual buildup of staff and equipment and a gradual phasing out of the development efforts.

Table 3

Annual Operation Expenses of Computer Facility

personnel[1]				
director ½ time	$ 9,000			
operations manager	13,000			
software maintenance 14K and 11K	25,000			
computer operators (3)	24,000			
secretary ½ time	3,500			
clerical support - 3 positions	15,000			
systems engineer 3/4 time	10,500			
systems librarian	12,000	112,000		
fringe benefits - 11% of direct labor	12,320			
supplies - 6% of direct labor	6,720			
overhead - 40% of direct labor	44,800	63,840	$175,840	
equipment expenses[2]				
monthly rental - 35K	420,000			
maintenance at 10 %	42,000			
supplies at 5%	21,000		$483,000	
Total site operation expenses				$658,840

1. The personnel employed only part time in this capacity are part of the development staff as well, making all professional positions full time.

2. These are estimates based on rough guesses of the system development staff, which at this time includes no expertise in hardware. Reviews by hardware experts confirm the reasonableness of these estimates.

Table 4

Project Expenses by Year

Project year	one - time only expenses	conversion expenses	operation expenses[1]	development expenses	Total
year 1, F.Y. 71	301,060	190,014	157,060	248,004	896,138
year 2, F.Y. 72		190,014	314,121	496,008	1,000,145
year 3, F.Y. 73		190,014	471,181	496,008	1,157,203
year 4, F.Y. 74		190,014	471,181	372,006 124,002 [2]	1,157,203
year 5, F.Y. 75		190,014	504,123	372,006	1,066,143
year 6, F.Y. 76		190,014	537,064	248,004	975,082
year 7, F.Y. 77		190,014	602,947	248,004	1,040,965
year 8, F.Y. 78		190,014	668,830	124,002	982,846
Phase 1 total	301,060	1,520,112	1,413,543	1,612,026	4,846,741
Phase 2 total	0	0	2,312,964	1,116,018	3,428,982
Total	301,060	1,520,112	3,726,507	2,728,044	8,275,723

1 - Operating expenses have been assigned to project phases by the year in which they occur. Operating expenses are not developmental in the same sense as the other expenses, but are included in this analysis because they are a direct result of automation and are part of the expenses which must be offset by system benefits.

2 - This line indicates the break between phase I costs and phase II costs.

4. SYSTEM BENEFITS

Automation of any system as large and complex as that of the University of Minnesota Libraries introduces many benefits which should be included in a thorough costs/benefits analysis. We will confine our detailed examination of benefits to only the most conspicuous tangible benefits. We will first examine the effects of automation on personnel, showing the amount of personnel at various skill levels who could be reallocated as a result of automation. We will then examine the effects of automation on the building space requirements. Then, merely to illustrate the potential benefits not included in those statements of benefits, we will show the effects of automation on a special project, a large transfer of materials. Finally, we will suggest some other areas where tangible benefits of automation would be realized.

In the detailed presentation of the potential benefits of automation on the present system we made the assumption that the automated system proposed could be made operable immediately. This had the effect of limiting estimates to the implications of automation rather than to those of automation and those of time as well. To project these to more realistic time frames in the comparison of costs and benefits in sub-section 5 we assume that the proportions of personnel time and building space saved would remain the same.

4.1 PERSONNEL ALLOCATION

The greatest effects of automation are on the allocation of personnel within the library system. To determine these effects we used figures for the Wilson, Walter, and dependent department libraries (those which use central processing) and projected the proportions to the entire system.

Table 5 shows the results of a survey of the department libraries and the special collections to determine the effect automation would have on present activities. Most units were individually polled to determine the proportion of time spent on technical processing and the proportion spent on public service. The results of this query are shown. Also shown are the estimates of savings in staff which would be achieved with automation in the opinion of the department librarians. These estimates reflect savings in effort to perform the same levels of activities and service presently carried on, not that which is needed to provide optimum service.

Table 6 shows the effects of automation on the central processing and service areas in Wilson and Walter libraries. These estimates too are made by the staff involved in these activities in most cases. Exceptions are in situations where automation would have an effect on the entire structure of the activity so that those presently engaged in the activity would not recognize it (circulation and

reference services would be affected in this way -- and neither are greatly affected in terms of staff allocations). Table 6 also summarizes the staff who could be reallocated for increased services, or any other purpose, as a result of automation. In interpreting these figures it must be understood that the assumption underlying them is that the envisioned system were operating at the present time. Since it will take four years to develop and install such a system, it will never exist in this environment. But the benefits will be even greater in the future as the volume of activity and the number of staff increase.

Table 5

Staff Allocations[1]

Collection	Total			Technical Processing			Public Services		
	prof	cler	misc	prof	cler	misc	prof	cler	misc
Ames	1.0	1.0	3.5	0.8	0.7	2.5	0.2	0.3	1.0
Architecture	1.0	0.0	0.0	0.9	0.0	0.0	0.1	0.0	0.0
Art	1.0	1.0	1.7	0.5	0.5	0.8	0.5	0.5	0.9
Bell	2.0	1.0	0.8	0.7	0.25	0.0	1.3	0.75	0.8
Business Reference Services	1.0	0.5	1.0	0.65	0.25	0.85	0.35	0.25	0.15
Chemistry	2.0	1.0	1.0	1.0	0.15	0.5	1.0	0.85	.5
College	1.0	1.0	1.0	0.25	0.5	0.25	0.75	0.5	.75
Documents	4.0	2.0	1.5	1.2	2.0	0.45	2.8	0.0	1.05
East Asian	3.0	0.0	1.75	2.5	0.0	1.0	0.5	0.0	.75
Education	3.5	3.0	9.7	2.0	1.5	4.8	1.5	1.5	4.9
Engineering	2.0	1.0	1.1	1.2	0.75	0.1	0.8	0.25	1.0
Geology	1.0	1.0	1.2	0.2	0.8	0.2	0.8	0.2	1.0
Immigrant Archives	2.0	1.0	0.5	1.8	1.0	0.5	0.2	0.0	0.0
Journalism	1.0	0.0	1.4	0.5	0.0	0.7	0.5	0.0	0.7
Kerlan	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0
Maps	1.0	0.5	1.5	0.8	0.25	0.75	0.2	0.25	0.75
Marshall High	2.0	0.6	1.1	1.0	0.3	0.6	1.0	0.3	0.5
Math - Physics	1.0	1.0	0.4	0.75	0.1	0.0	0.25	0.9	0.4
Middle East	1.0	1.5	0.75	0.9	1.5	0.75	0.1	0.0	0.0
Mines	1.0	0.0	0.9	0.6	0.0	0.5	0.4	0.0	0.4
Music	1.0	1.0	2.6	0.3	0.2	0.5	0.7	0.8	2.1
Natural History	1.0	0.0	0.6	0.7	0.0	0.4	0.3	0.0	0.2
Newspaper	1.0	1.0	1.75	0.3	1.0	0.6	0.7	0.0	1.15
Pharmacy	1.0	0.0	0.1	0.3	0.0	0.1	0.7	0.0	0.0
Public Administration	1.0	1.0	0.9	0.65	0.8	0.8	0.35	0.2	0.1
Spec. Collections - rare books	1.0	1.0	1.1	0.80	0.6	0.65	0.2	0.4	0.45
Social Welfare History Arch.	.75	1.0	0.6	0.65	1.0	0.6	0.1	0.0	0.0
University Archives	3.0	1.0	0.7	2.7	1.0	0.7	0.3	0.0	0.0
Total	42.25	23.10	39.15	25.15	15.15	19.60	17.10	7.95	19.55
Automation Staff Savings				50%	50%	75%	15%	10%	5%

[1]Total staff figures are the most recent available.

Table 6

Staff Reallocation Potential

Activity	Present System			Automated System			Realloc. Potential		
	Pro	Clr	Msc	Pro	Clr	Msc	Pro	Clr	Msc
Processing Department	26.0	32.5	16.1	16.0	11.0	6.3	10.0	21.5	9.8
Serials Records[1]	4.0	7.0	1.9	2.0	2.0	3.3	2.0	5.0	(1.4)
Current subscriptions	3.0	6.0	1.9	1.6	1.3	3.3			
new items	1.5			.8					
items received		4.0	1.9		.6	3.3			
claims sent		1.0							
correspondence received		1.0			.7				
pre-acquisition activity	.5			.3					
internal record keeping	.5								
gift and exchange transactions	.5								
Back orders	1.0	1.0		.4	.7				
orders	.2			.2					
cancelled orders	.1								
claims	.2								
quotes sent	.1			.1					
quotes received		.1			.1				
correspondence received		.3			.2				
items received		.6			.4				
want listing	.2								
pre-acquisition activity	.2			.1					
Business Operations[3]	1.0	12.0	1.7	1.0	4.0	.5		8.0	1.2
Orders and receipts		7.0	1.2		2.0	.5			
orders		2.0							
cancells		.5			.3				
claims		1.0	1.0						
receipts									
ordered separately		1.5	.2		.4	.5			
blanket orders		.4			.2				
standing orders		.4			.2				
volumes returned		.2			.2				
correspondence		1.0			.7				
Accounting		2.0			1.0				
credits		.1							
encumbrances		.4							
expenditures		.5							
reconciliations		1.0			1.0				
Bindery Preparation		3.0	.5		1.0				
items bound		2.0	.5		.7				
returned items		1.0			.3				

**See footnotes at end of table.

Table 6 (cont.)

Staff Reallocation Potential

Activity	Present System			Automated System			Realloc. Potential		
	Pro	Clr	Msc	Pro	Clr	Msc	Pro	Clr	Msc
Cataloging[2]	21.0	13.5	12.5	13.0	5.0	2.5	8.0	8.5	10.5
new titles using LC,NLM,etc.	5.2			2.0					
other new	5.2			5.2					
added titles	6.0	4.0	1.0	3.5	3.0				
withdrawn titles	.1								
microform items added	1.0			1.0					
cards filed-shelf & catalog		1.0	1.5						
LC depositor cards filed		.1	1.5						
volumes transferred, reclass, recatalogued	.5			.3					
revisions	2.0			1.0					
card ordering		.2							
card preparation		4.0	4.5						
marking		1.0	4.0		.5	2.5			
internal record keeping	1.0	.4							
correspondence		1.0			.7				
preliminary cataloging		1.8			.8				
Resources Department[2]	12.0	3.0	13.6	7.0	2.0	3.0	5.0	1.0	10.6
faculty liason	.8			.8					
materials selection	2.5		.1	2.5					
supervision	1.7	.4	.2	.7	1.4	.2			
corres.-orders & quotes	.7	.5	2.0	.5					
prof. organ. activities	.5	.1		.5	.1				
interdept. communication	1.5			.5					
intradept. communication	1.6			1.1					
proof sheet handlings			.3						
searching	1.0	.7	5.4						
verifying	1.3	1.2	5.6		.5	2.8			
filing		.1							
reference service	.4			.4					
Reference Services[3]	9.3	5.0	6.2	6.0	4.5	6.2	3.3	.5	
reference desk	6.3	2.0	2.4	5.0	2.0	2.4			
catalog infor. desk	2.0								
periodicals	1.0	3.0	3.8	1.0	2.5	3.8			
Circulation[3]	9.0	35.0	21.0	7.0	28.0	21.0	2.0	7.0	
Reserve	2.0	8.0	8.3	2.0	7.0	8.3			
Wilson	1.0	5.0	3.4	1.0	4.5	3.4			
Walter	1.0	3.0	4.9	1.0	2.5	4.9			
Interlibrary Circulation	4.0	5.0	.7	3.0	3.0	.7			
interlibrary loan	3.0	3.0	.7	3.0	3.0	.7			
minitex	1.0	2.0							
Central circulation	3.0	21.0	10.6	2.0	17.0	10.6			
volumes checked out		7.0	4.1		7.0	4.1			
recalls		2.0	.5		2.0	.5			
late notices		3.0							
lost volumes recorded		.5			.5				
lost volumes returned		.5			.5				
fine notices sent		1.0	1.4			1.4			
renewals		1.0	.5		1.0	.5			
volumes returned		6.0	4.1		6.0	4.1			

**See footnotes at end of table

Table 6 (cont.)

Staff Reallocation Potential

Activity	Present System			Automated System			Realloc. Potential		
	Pro	Clr	Msc	Pro	Clr	Msc	Pro	Clr	Msc
Department library activities[4]	42.3	23.1	39.2	27.1	14.7	33.3	15.2	8.4	5.9
technical processing	25.2	15.2	19.6	12.6	7.6	14.7			
public services	17.1	7.9	19.6	14.5	7.1	18.6			
TOTAL for network of dep. lib.	98.6	98.6	96.1	63.1	60.2	69.8	35.5	38.4	26.3
Independent libraries[5]	43.0	43.0	39.1	27.5	26.2	28.4	15.5	16.8	10.7
Bio-Medical	8.0	11.0	10.5						
Law	10.0	9.0	3.4						
St.Paul (total)	11.0	10.0	9.5						
Crookston	1.0	3.0	2.6						
Duluth	10.0	7.0	7.6						
Morris	3.0	3.0	4.8						
Waseca	0.0	0.0	.7						
TOTAL for all libraries[6]							51.0	55.2	37.0

**]

Estimates for present staff distribution by staff involved, estimates of automation system distribution by systems division staff using projected system configuration for automation.

[2]Estimates of present and automated system staff requirements both made by staff involved in the activity.

[3]Estimates of present system and automated system were made by system division staff using known volumes of activities.

[4]Based on figures from Table 5.

[5]The effects of automation were projected by using the ratios of change in the dependent library network - 64% prof, 61% cler, 72.6% misc.

[6]These totals do not include library administration personnel. We assume staff for administration would not be affected by automation.

4.2 BUILDING SPACE REQUIREMENTS

Building space requirements for the library would be greatly affected by automation. Three automation results have immediate and calculatable impact on space requirements. The reduction in technical processing staff would provide additional space for user services of one form or another. The reduction in "in process" backlogs resulting from faster and more efficient processing of materials would make available the space presently used to store this backlog. And, the elimination of large manual files for various technical processing functions would free space for other purposes. Table 7. presents a summary of the space savings which would result from these aspects of automation.

An additional and more significant space saving could be derived from more appropriate use of open shelf storage for library materials. The potential savings automation could provide by maintaining complete files of material utilization patterns is demonstrated by a survey conducted by the systems division and summarized in Table 8.

The total effects of automation on building space in Wilson Library result in a saving of 21,781.5 square feet (using figures from line 5 of Table 8) of floor space assuming the proposed system were available at the time of this analysis. Additionally, the slope of the projected growth curve of library building needs is reduced by automation. The effects of these factors on future building needs are shown in the cost/benefits comparison section.

Table 7

Space Requirements Benefits[1]

Personnel Space (Wilson only)[2]			
Processing Department	31.5 full time	3,150.0	
	9.8 misc. help	784.0	
Resources Department	6.0 full time	600.0	
	10.6 misc. help	848.0	
Reference Services	3.8 full time	380.0	
Circulation	8.5 full time	850.0	6,6120.0
"In process" Materials Space[3]			
Negative answers (126 stack sections)		1,248.0	
Technical processing (88 stack sections)		1,056.0	
Serials records (17 stack sections)		204.0	
Bindery preparation (9 stack sections)		108.0	2,616.0
Manual files eliminated by automation			
Cataloging area		575.0	
Orders and receipts		126.0	
Accounting		70.0	
Interlibrary loan		37.5	
Circulation		207.5	
Reserve		25.0	
Serials records		262.5	1,303.5
Total Space saved by Automation convertible to Personnel Space			10,531.5

**See footnotes on the next page.

Space Requirements Benefits - footnotes

1. Figures are for Wilson Library (excluding Special Collections and departments within Wilson) only. A similar proportion of space would be saved in other collections and departments but the total savings in each may not be sufficient to justify the expenses involved in redesigning space utilization patterns for these facilities. For that reason, these space savings were not used in this analysis.

2. An average figure of 100 sq.ft. per full time employee and 80 sq.ft. per miscellaneous full time equivalent was used in these calculations.

3. These figures represent the space presently used to store these materials which could be converted to space for personnel. The need for housing materials temporarily in these areas would be met by trucks. On Thursday, April 16, at 10:00 a.m. there were 144 trucks in these areas which were 40% fully utilized. A truck is equivalent in shelf space to a stack section and the 240 stack sections were 80% fully utilized, so if truck utilization were increased to the 80% figure, the backlog would only need to be reduced by 60% to eliminate the permanent shelves. Furthermore, if the stack sections in areas not easily convertible to personnel space were included in the analysis (approximately 40 stack sections in stairway wells, partitions between offices or sections and so forth) at 80% utilization, the backlog would only need to be reduced by 45% to eliminate these permanent stacks which detract from space for personnel.

Table 8

Materials Storage Space Benefits[1]

Characteristic of materials for non-browsable storage sections		Shelf Sample % of Total	Stack Pickup % of Total[2]	Sq.ft. of Space Saved[3]
On shelf in:	Not circulating since:			
1964	1964	57.6	10.3	14.400
1959	1964	53.0	10.0	13,250
1954	1964	49.8	8.8	12,450
1949	1964	45.1	7.7	11,275
1959	1959	44.9	6.8	11,250
1954	1959	41.7	5.6	10,425
1949	1959	37.0	4.4	9,250
1954	1954	26.0	4.7	6,500
1949	1954	21.3	3.5	5,325
1949	1949	18.2	2.7	4,550

**See footnotes on the next page.

Materials Storage Space Benefits - footnotes

1. These figures are based on a survey of materials on the shelf (a randomly chosen sample of 1000 volumes) and a survey of the materials picked up in the stacks and student work areas for reshelving on a typical day (Wednesday, April 29, 1970). These studies were done by Systems Division Staff for purposes of this analysis. Larger samples would be necessary to support an analysis to develop a more sophisticated means of selected materials for non-browsable storage (by subject, author, date of material, type of work, length, language, etc.). However, this study is sufficient to demonstrate the potential savings which could be derived from a more efficient use of open shelves.

2. This column demonstrates the close correspondence between the materials circulating and those used in the library. Of those 6.8% of the picked-up material which were more than 10 years old and had not circulated in 10 years (23 volumes), 7 were historical reference works, 7 were short pamphlets of historical interest which could easily be absorbed in a single sitting, and 4 were foreign language pamphlets which were also very short. The obvious classifiability of these materials lends support to the premise that a suitable method of selecting materials most appropriate for non-browsable storage could easily be developed. The computer could easily then select those materials from the collections.

3. These estimates assume that the materials described would be put in non-browsable stacks which contain twice as much material per square foot. To accomplish this savings in storage would not even require rearranging the stacks, since on the average ½ the shelf space in the stacks is empty (6 of 8 shelves are used and 24 inches of the 36 inches available on each shelf in use contain books). These estimates also refer only to the savings possible in the general collection in Wilson Library (floors 2 and 3) assuming they are presently stored at 10 volumes to the square foot of floor space (a figure used in Library Building Needs to 1980, a report of the Library Facilities Committee published in 1967) and using a figure of 500,000 volumes in the collection.

4.3 TRANSFERS OF LIBRARY MATERIALS

Technical processing in a library involves many special projects in addition to the normal processing activities. These include such things as materials inventorying, special file maintenance activities, experiments in new operational methods, transfers of materials within the library system, and special cataloging of certain types of materials (pamphlets, microform items, maps, reports, etc.). To illustrate the potential benefits of automation on such special projects, a detailed analysis of the cost of one type of special project, transfers, was performed by the System Division.

The present trend in the University Library system is toward an increasing volume of transfers per year. Numerous physically separated departmental collections, seven campuses, greater recognition of the need to be responsive to faculty and student needs, and a growing student body, faculty and curriculum all contribute to the increase in the volume of transfers. At the same time, the cost of transfers is rising. Increasing personnel costs and the complexities of an ever larger and older system are the principle reasons for the increase in cost.

Proposals for the future development of the University have discussed the possibility of major changes in the functions of the various campuses. One proposal suggests the relocation of the business school, the School of Public Administration, and the social sciences from the West Bank campus to the St. Paul campus. Another suggests a shift in emphasis of the main campus to graduate level studies. Implementation of these proposals would have very significant impact of the library system. It is estimated that the growth in function of the St. Paul campus would require a transfer of 300,000 volumes from the Minneapolis campuses to the St. Paul campus. This is in addition to the normal volume of transfers, which is estimated to be about 20,000 per year.

Table 9 shows estimates of the cost of transfering materials made by the staff involved. Excluding the cost of catalogers for recataloging and reclassifying the materials, automation will result in a saving of $2 .034 per volume transferred. In addition, automation is expected to save 15 per cent of the catalogers time in recataloging and reclassifying. While no figure is presented as an average cost per volume for these cataloging activities due to the variability in unit cost for different kinds of transfers, it is unlikely that for any period of time or any large project the average cost would be less than $1.50 per volume, of which automation could save $.225. Thus, automation can be expected to reduce the cost of transfering a volume by more than $2.25. On a project such as the large transfer of materials to St. Paul, this would result in a total saving of $675,000.

Table 9

Costs of Transfers[1]

Task	STAFF[2]	Transactions / Transfer	Present System		Automated Syst.		Auto. Benefits	
			Transactions / Hour	Cost per Title	Transactions / Hour	Cost per Title	Transactions / Hour	Cost per Title
Title selection	pr	.05	25	0.010	25	0.010		.018
Shelf list card pulling	st	2.0	225	.018				
Catalog card pulling	st	8.0	125	.128				.128
Pulling revisions	pr	1.0	30	.167				.167
Pulling volumes	st	1.0	200	.010	200	.010		
Searches for missing vols.	la	.10	2	.150	5	.060	3	.090
Set flag for circ. returns	st	.10	150	.001				.001
Recat./reclassifying[3]	pr							
Stencil typing	st	1.0	10	.200				.200
Stencil revision	pr	1.0	36	.139				.139
Card printing[4]	st	10.0		.510				.510
Card preparation typing	st	10.0	100	.200				.200
Card revision	pr	1.0	30	.167				.167
Remarking[5]	st	1.0	50	.040	75	.027	25	.013
Transporting materials	la	1.0	1000	.003	1000	.003		
Reshelving	st	1.0	150	.013	150	.013		
Filing in catalog	la	8.0	125	.192				.192
Filing revisions in catalog	pr	8.0	250	.160				.160
Filing in shelf list	la	2.0	225	.027				.027
Filing revisions in shelf list	pr	2.0	450	.022				.022
TOTAL (excluding cataloging)				2.157		0.123		2.034

**See footnotes on the next page.

Costs of Transfers - footnotes

1. Due to the unavailability of information, a complete estimate of transfer costs is impossible. However, the figures for tasks most affected by automation are presented, so the benefits of automation, though somewhat diminished by missing data are fairly accurate.

2. pr - professional, costed at $5.00 per hour. la - library assistant costed at $3.00 per hour. st - student costed at $2.00 per hour.

3. The work involved here depends upon the nature of the transfer. There are four kinds of transfers with very different cataloging requirements:

   Transfers within a system
   - duplicate exists - 1/12 hour prof., 1/6 hour lib. asst. per transfer.
   - no duplicate exists - 1/12 hour prof. per transfer.

   Transfers to a system with different cataloging scheme
   - duplicate exists - 1/12 hour prof., 1/4 hour lib. asst. per transfer.
   - no duplicate exists - 1 hour professional per transfer.

   If the types of transfers were equally divided between the four, the average cost per title would be $1.875.

4. Cost is for L.C. cards. It was impossible to determine the cost of card printing locally, but it appears to be somewhat less expensive, perhaps even considerably less expensive.

5. Remarking effort depends to a large extent on the kind of cataloging necessary. Spine labels, book plates, catalog number on title page, pocket, and charge card may all change as a result of a transfer. 50 transactions per hour is an average assuming ½ of remarking is minimal, ½ is extensive.

4.4 ADDITIONAL BENEFITS OF AUTOMATION

Automation will have many beneficial effects which are not reflected in the foregoing analysis of the system benefits. Some of these will be briefly mentioned here merely to suggest some of the possibilities. No attempt will be made to assign a dollar value to these benefits, though values could have been assigned if consideration of these secondary benefits of automation had been necessary to provide sufficient evidence of the feasibility of the proposed system.

1. Changing work patterns. Automation will relieve professionals and non-professionals as well of the routine and least rewarding activities. Further, it will open up new areas of interesting activities for both and will enable staff to perform many interesting and productive functions in the area of expanded user services which are now left undone. These effects of automation can be expected to reduce staff turnover, and thereby reduce the costs of staff training and additional supervision for new employees to replace staff who have resigned for more interesting positions elsewhere.
2. Reduction in error rates. All manual systems are plagued by a high rate of human errors and thus the need to double or even triple check all manual operations. In the library, despite the duplication of effort to minimize errors, errors do occur. Duplicate orders, late claims, and misfiled catalog cards are often a result of an error. Automation enables all secondary transactions resulting from a primary transaction to occur without human intervention, thus limiting the possibility of error to only the primary transaction. In an automated system, the acquisition decision results in automatic checking to avoid duplicate orders, ordering, claiming, canceling and reordering if necessary, and check-in of materials. Similarly, cataloging results in automatic production of marking labels and automatic filing of all necessary information in catalog and shelf list files.
3. User service improvements. Automation of technical processing services will yield benefits to library users through faster through-put, more error free user information sources, complete bibliographic location, and status information available at all system entry points, and more professional services as a result more efficient use of professional staff.
4. Reduction of losses. By producing confirmation of authorized loan cards to be carried in the jacket of the book, so book numbers on the jacket can be compared to the number on the card, losses of materials can be minimized. In addition, better monitoring of utilization rates will give some indication of which materials are in greatest demand, and therefore, more likely to be removed. These can then be placed in the reference room.
5. Acquisition efficiency. Automation will provide the opportunity to improve acquisition decisions by monitoring utilization rates. Of course, utilization rates are not the only criteria for selection of materials, but they can be very

important for establishing budgets by subjects and for decisions involving added copies.

6. Library resources allocation efficiencies. The management information which is a by-product of operation of the automated system will enable the library management to assign personnel, space, equipment, and all other library resources to more effectively meet library objectives at the same or lower costs. The potential for reallocation is enhanced by the availability of all system data at every system entry point. This changes significantly the pros and cons concerning centralized verses decentralized technical processing services.
7. Improved cash flow. The automated system, by monitoring continuously all outstanding orders and claiming, cancelling, and recording at appropriate time intervals will minimize the total amount of encumbered funds.
8. Increased total time on shelf. The automated system will reduce all processing activity times thereby increasing the total time each piece of material is available to users. This benefit will accrue not only at the time of acquisition of the material; circulation processing will be affected, and marking, transferring, and binding operations will also be affected.
9. Responsiveness to changing demands. Manual systems of the size and complexity of the University Library system cannot be easily and repeatedly modified to be responsive to changing demands. Automated systems, on the other hand, since the introduction of third generation hardware and modular software technology, are geared to the demands of an evolutionary system.

5. COSTS TO BENEFITS COMPARISON

To compare system costs with system benefits it is necessary to put the two in the same time frame. Table 4 presents the eight year project budget over each year of the project. Table 10 puts the staff reallocation benefits in a similar time frame, but projecting out ten years. Table 11 does the same for building space requirements.

Table 12 summarizes the comparison between costs and benefits for each of the first ten years of the project and its operation. It can be seen that even using an incomplete accounting of system benefits (only personnel and building space requirements) and using the most conservative assumptions about the magnitude of change on personnel and space as a result of automation the proposed system is readily economically justifiable. Before the system is even fully developed, it will pay for itself (cumulative net benefits become positive by the end of the seventh year).

The footnotes following the tables present the rationales and assumptions underlying the figures. To insure accurate interpretation of these figures the footnotes should be read very carefully.

It is important to emphasize that every effort was made to avoid an exaggeration of net benefits. The footnotes should make it very clear that we were at all times guarding against this possibility.

Table 10

PERSONNEL COST AVOIDANCES[1]

	Full Time Staff (Adm Est)[2]	Professional				Clerical				Miscellaneous				Personnel Costs[3]	
		Prsnt Systm	Auto Systm	Cum. Diff 2-3	Ann. Incr. to 4	Prsnt Systm	Auto Systm	Cum. Diff 6-7	Ann. Incr. to 8	Prsnt Systm	Auto Systm	Cum. Diff 10-11	Ann. Incr. to 12	Annual Cost Avoid. from 4, 8, 12	Cumul. Cost Avoid. from 14
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1966	258	125	125	0	0	123	123	0	0	120	120	0	0	0	0
1967	278	134	134	0	0	134	134	0	0	130	130	0	0	0	0
1968	294	142	142	0	0	142	142	0	0	140	140	0	0	0	0
1969	312	151	151	0	0	151	151	0	0	150	150	0	0	0	0
1970	331	160	160	0	0	161	161	0	0	160	160	0	0	0	0
1971	350	169	169	0	0	170	170	0	0	170	170	0	0	0	0
1972	368	178	178	0	0	179	179	0	0	180	180	0	0	0	0
1973[4]	386	186	169	17	17	189	170	19	19	190	177	13	13	291,910	291,910
1974	404	195	160	35	18	198	158	40	21	200	172	28	15	608,290	900,200
1975	422	204	131	73	38	207	126	81	41	210	152	58	30	1,256,820	2,157,020
1976	440	212	136	76	3	217	133	84	3	220	160	60	2	1,305,960	3,462,980
1977	458	221	141	80	4	226	138	88	4	230	167	63	3	1,372,390	4,835,370
1978	476	230	147	83	3	235	144	91	3	240	174	66	3	1,424,260	6,259,630
1979	494	239	153	86	3	245	150	95	4	250	181	69	3	1,480,580	7,740,210
1980	513	248	159	89	3	255	156	99	4	260	189	71	2	1,534,170	9,274,380
1981	532	257	164	93	4	265	162	103	4	270	196	74	3	1,600,600	10,874,980

**See footnotes following this table.

Personnel Cost Avoidances - footnotes

1. All figures represent positions as of the beginning of the fiscal year. Estimates are based on historical trends. Estimates of Automation system benefits are based on the analysis presented in Table 6, 36% reduction in professional staff, 38.9% in clerical staff, and 27.4% in miscellaneous staff.

2. Reported in Library Building Needs to 1980, a report of the Library Facilities Planning Committee, published in December, 1967. Differences between Column 2 plus Column 6 and these estimates reflect the size of the administrative staff. These personnel were not used in this analysis since the number of staff employed in this capacity would be only slightly affected by automation in the short run.

3. Costs are in 1969 dollars, based on averages of $10,110 per year for professional staff, $4450 per year for clerical staff, and $2730 per year for full time equivalent miscellaneous positions. These figures represent only direct labor costs.

4. 1973 is the end of the second year of the project. By that time 9% of professional time, 10% of clerical time, and 7% of miscellaneous time would be saved by automation. Comparable figures for the third year are 18%, 19%, and 14% and by the fourth year the maximum benefits (36%, 38.9%, 27.4%) would be realized.

Table 11

SPACE REQUIREMENTS SUMMARY

	Staff Space[1]				Materials Space[2]				Total Space Present System 1+5+ Seating	Total Space Auto System 2+6+ Seating	Total Cumul Diff. 9-10	Total Annual Increm. to 11
	Present System	Auto System	Cumul. Diff. 1-2	Annual Incrm.	Present System	Auto System	Cumul. Diff.	Annual Increm.				
	1	2	3	4	5	6	7	8	9	10	11	12
1966	25,800	25,800	0	0	275,683	275,683	0	0	473,183	473,183	0	0
1967	27,800	27,800	0	0	286,309	286,309	0	0	492,158	492,158	0	0
1968	29,400	29,400	0	0	300,000	300,000	0	0	514,400	514,400	0	0
1969	31,200	31,200	0	0	312,500	312,000	0	0	535,700	535,700	0	0
1970	33,100	33,100	0	0	325,000	325,000	0	0	556,600	556,600	0	0
1971	35,000	35,000	0	0	337,500	337,500	0	0	577,500	577,500	0	0
1972	36,800	36,800	0	0	348,740	348,740	0	0	605,640	605,640	0	0
1973[3]	38,600	36,570	2,030	2,030	359,980	359,980	0	0	633,780	631,750	2,030	2,030
1974	40,400	34,340	6,060	4,030	371,220	363,796	7,424	7,424	661,920	648,436	13,484	11,454
1975	42,200	27,430	14,770	8,710	382,460	367,162	15,298	7,874	690,060	659,992	30,068	16,584
1976	44,000	28,600	15,400	630	393,700	370,078	23,622	8,324	718,200	679,178	39,022	8,954
1977	45,840	29,800	16,040	640	407,460	374,863	32,597	8,975	742,200	693,563	48,637	9,615
1978	47,680	30,990	16,690	650	421,220	379,098	42,122	9,525	766,200	707,388	58,812	10,175
1979	49,520	32,190	17,330	640	434,980	391,582	43,498	1,376	790,200	729,372	60,828	2,016
1980	51,360	33,380	17,980	650	448,740	403,866	44,874	1,376	814,200	751,346	62,854	2,026
1981	53,200	34,580	18,620	640	462,500	420,250	46,250	1,376	838,200	773,330	64,870	2,016

**See footnotes following this table.

Space Requirements Summary - footnotes

1. Estimates of staff space are taken from Library Building Needs to 1980, a report of the Library Facilities Planning Committee published in December, 1967. Automation benefits of 35% of staff building needs are used in this analysis, based on the fact that full time staff would be reduced by over 37% to perform the same level of activity as shown in Table 6 and on the fact that personnel supportive facilities are reduced considerably by the elimination of manual files and space for extensive work in-process backlogs as shown in Table 7.

2. Estimates of materials space are from the same source. Automation benefits in materials space are estimated to be 12.5% of the space for books. Space for other materials in the short run would be relatively unaffected by automation. The 12.5% figure is based on an estimate that 25% of the materials in the Library (We know from the study presented in Table 8 that 44.9% of the general collection falls in this category) could be in user accessable but non-browsable storage packed twice as densely as browsable storage. Additional space savings are possible by having some materials in non-user accessable storage which could be packed at least 4 times as densely as browsing collections, but this consideration was not included in the analysis.

3. 1973 is the end of the second year of the four year effort on Phase 1. Benefits begin to be realized from the investment at this time. Personnel space becomes available at the rate of 5% in this second year, 15% in the third year, and the full 35% in the fourth year. Material space reductions become available at the rate of 2.5% in the third year, 5% in the fourth year, 7.5% in the fifth year, 10% in the sixth year, and the full 12.5% by the seventh year.

Table 12

COSTS/BENEFITS ANALYSIS SUMMARY

Year Ending June 30	Budgeted Project Expenses[1]					Revenues[3]				
	One-time only	conversion	develop-ment	operations[2]	Total 1+2+3+4	Grants[4] (Public Sources)	Grants[4] (Private Sources)	Fees[5] (Public funded libs)	Fees[5] (Private funded libs)	Total 6+7+8+9
	1	2	3	4	5	6	7	8	9	10
1972	301,060	190,014	248,004	157,060	896,138	0	0	0	0	0
1973	0	190,014	496,008	314,121	1,000,143	0	0	0	0	0
1974	0	190,014	496,008	471,181	1,157,203	0	0	0	0	0
1975	0	190,014	496,008	471,181	1,157,203	0	0	0	0	0
1976	0	190,014	372,006	504,123	1,066,143	50,000	25,000	13,180	6,590	94,770
1977	0	190,014	248,004	537,065	975,083	50,000	25,000	26,360	13,180	114,540
1978	0	190,014	248,004	602,956	1,040,974	75,000	50,000	52,720	26,360	204,080
1979	0	190,014	124,002	668,840	982,856	75,000	50,000	79,080	39,540	243,620
1980	0	0	0	734,724	734,724	0	0	105,440	52,720	158,160
1981	0	0	0	734,724	734,724	0	0	105,440	52,720	158,160

**See footnotes following this table.

Table 12 (cont.)

COSTS/BENEFITS ANALYSIS SUMMARY

Year Ending June 30	System Costs	Partial System Benefits[6]			Net Annual Benefits	Cumulative Net Benefits
	Expenses less Revenues	Personnel cost Avoided[7,8]	Building Construction Costs Avoided	Total 12+13	Benefits less costs 14-11	
	11	12	13	14	15	16
1972	896,138	0	0	0	(896,138)	(896,138)
1973	1,000,143	284,610	0	284,610	(715,533)	(1,611,671)
1974	1,157,203	593,080	222,720	815,800	(341,403)	(1,953,074)
1975	1,157,203	1,225,400	236,220	1,461,620	304,417	(1,648,657)
1976	1,066,143	1,278,310	249,720	1,528,030	461,887	(1,186,770)
1977	975,083	1,338,080	269,250	1,607,330	632,247	(554,523)
1978	1,040,974	1,388,250	285,750	1,674,000	633,026	78,503
1979	982,856	1,443,570	41,280	1,484,850	501,994	580,497
1980	734,724	1,495,820	41,280	1,537,100	802,376	1,382,873
1981	734,724	1,560,590	41,280	1,601,870	867,146	2,250,019

**See footnotes following this table.

Costs/Benefits Analysis Summary - footnotes

1. These figures include development and operating expenses for Phase 2 as well as Phase 1. This results in a serious understatement of net benefits, since system benefits calculations for this analysis do not include Phase 2 benefits to other libraries. Performing the comparison between costs and benefits in this manner demonstrates the feasibility of developing software for the state network and for general purpose technical processing support for outstate libraries on a non-cost-reimbursable basis, using the experience and the cost benefits of Phase 1 to support the effort. Phase 2 development costs include the amounts shown for years 5-8 plus 25% of that shown for year 4 for a total cost of $1,116,018. Phase 2 operations costs include amounts in addition to $471,181 (the cost of operation of the basic computer installation to support only the U. of M. operation) shown in column 4 for years 6-10 for a total cost of $965,346. Thus $2,081,364 of the project expenses are for the Phase 2 effort. This is the amount of the understatement of net benefits to the U. of M. Library..

2. The annual cost of a computer installation to support the total system proposed is $658,840 as shown in Table 3. Of this amount, 70% or $461,181 is for actual operation of the system (plus $10,000 transmission line costs makes total system operation costs $471,181), 10% is allocated to the retrospective conversion of bibliographic information, and 20% for system development. In year 5 (1976) the development effort is reduced and 5% of the site operation is diverted to the support of outstate terminals. A similar reduction in the development effort and corresponding increase in support to outstate terminal operation occurs in year 6. In year 7 an increase in operating costs of the computer installation of 10% is necessary to support an additional shift for off-line processing and for additional storage for outstate operations. In year 8 development demands for computer support go to zero (only system testing in an operational mode is performed). In year 9, the 10% of the original site expenses employed in conversion becomes available for outstate terminal support. Year 1 (1/3 of site expenses) and year 2 (2/3 of site expenses) reflect the gradual build-up of equipment which will be necessary to minimize costs.

3. These figures were not used in the calculation of net benefits, thus column 11 is identical to column 5. The reason they were not used is because the actual amounts of revenue are governed more by political and other considerations than economic considerations and therefore are very difficult to predict.

4. Because the network development and general purpose technical processing support packages represent advances in the state of the art of library automation and because they have wide applicability to other groups of libraries (in other states or regions), the State of Minnesota should not be expected to finance the entire effort. We will make every effort to acquire additional funding, both for economic reasons and for product dissemination.

5. Fees to cover the cost of system operation and development of special purpose software unique to one user or group of users will be expected from subscribing libraries. The demand for these services by libraries throughout the state are difficult to predict, and no effort has been made to predice them in any detail. The figures shown represent an allocation of non-Minneapolis/St.Paul campus operating costs of 40% to U. of M. outstate campuses, 40% to other public funded libraries, and 20% to private funded libraries. The figures shown do not include any estimate of special purpose software developed on a cost-reimbursable basis or under other such financial arrangements, although we fully expect a certain amount of this service to be necessary in support of outstate libraries.

Costs/Benefits Analysis Summary - footnotes (cont.)

6. These benefits are only partial because they do not reflect potential savings which were not treated in detail in this analysis. These additional benefits include such factors as reduced error rates, better user services, reducted time delays in processing materials and in responding to user requests, more efficient allocation of acquisition resources, and so forth.

7. These figures were calculated from those in column 14 of Table 10. Only 75% of the potential personnel cost avoided figures were used because non-economic considerations often influence personnel assignments, thus making the realization of all potential benefits unlikely. For instance, a department library may require a professional librarian even if there is only enough professional work to support a 50% position and a user service desk must be staffed even if there is not enough work to fully occupy the staff.

8. For these calculations overhead of 20% of direct labor, fringe benefits of 6% of direct labor, and supplies of 4% of direct labor were used (in calculations of budgeted project expenses corresponding percentages of 40, 11, and 6 were used for a total of 57% for expenses calculations compared to 30% for benefits calculations, reflecting the far higher proportion of professional positions in the system development staff then in the Library as a whole.)

9. These figures were computed by multiplying the potential materials storage space needs avoided in column 8 of Table 11 by a $30 per square foot construction cost. Additional on-going cost avoidances would be accumulating as a result of reduced total building maintenance cost of lesser total space.